Polygenic traits are traits that are controlled by more than one gene, i.e. height, weight, hair color, skin color (basically, anything that deals with size, shape and color). This allows for a wide range of physical traits. For example, if height was controlled by one gene A and if AA= 6 feet and Aa = 5 feet 7 inches and aa= 5 feet, then people would be one of three different heights. Since height is controlled by more than one gene, a wide range of heights is possible.

Once the pennies have been handed out (six for each group) and the procedures have been reviewed, the teacher will put a class result table on the board, so that the class can collect the data. Each group will record the number of times the following situations occurred when the pennies were flipped.

Activities

1. Each group will carefully flip all six coins on the lab table.
2. Record the number of heads and tails that result from the flip in table 1.
3. Continue to flip the six coins and continue to record the number of heads and tails that result from the flip until table 1 is complete.
4. Complete table 2 by adding up the number of times the following situations occurred.
   * 0 Tails and 6 Heads
   * 1 Tail and 5 Heads
   * 2 Tails and 4 Heads
   * 3 Tails and 3 Heads
   * 4 Tails and 2 Heads
   * 5 Tails and 1 Head
   * 6 Tails and 0 Heads
5. Record your results from table 2 on the white board with the class results.
6. Record the class results in table 2.
7. Construct a bar graph from the class data. The number of heads and tails will go on the X axis (the independent variable), while the number of times the situation occurred will go on the Y axis (the dependent variable).
8. Answer the questions.

**Results:**

Table 1: Group results

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Flip (Group) | 1 | 2 | 3 | 4 | 5 |
| Number of tails |  |  |  |  |  |
| Number of heads |  |  |  |  |  |

Table 1: continued

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Flip (Group) | 6 | 7 | 8 | 9 | 10 |
| Number of tails |  |  |  |  |  |
| Number of heads |  |  |  |  |  |

Table 2: Group and class results

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Flip  Situation | 0 T 6 H | 1 T 5 H | 2 T 4 H | 3 T 3 H | 4 T 2 H | 5 T 1 H | 6 T 0 H |
| Your Group  Total |  |  |  |  |  |  |  |
| Class Total |  |  |  |  |  |  |  |

Construct a Bar Graph for both your results and the class results.

**Conclusion:** Use the following Height Table to answer the questions.

|  |  |
| --- | --- |
| Penny Situation | Height |
| O Tails and 6 Heads | 6 feet 1 inch |
| 1 Tail and 5 Heads | 5 feet 11 inches |
| 2 Tails and 4 Heads | 5 feet 9 inches |
| 3 Tails and 3 Heads | 5 feet 7 inches |
| 4 Tails and 2 Heads | 5 feet 5 inches |
| 5 Tails and 1 Head | 5 feet 3 inches |
| 6 Tails and 0 Heads | 5 feet 1 inch |

Remember: Heads are dominant genes. Tails are recessive genes.

Questions:

1) Do parents give (All or Half) of their genetic material to their children?

Example for the rest of the questions: A man is 5 feet 7 inches tall, has 3 heads (dominant genes) and 3 tails (recessive genes). He will give 3 genes to his child. These 3 genes can be given randomly.

He can give 3 dominant genes and no recessive genes

He can give 2 dominant genes and 1 recessive gene

He can give 1 dominant gene and 2 recessive genes

He can give 0 dominant genes and 3 recessive genes

These are all the possible combinations that he can give his child. The height of the mother will dictate the genes that she will give to the child. The combination of the mother's genes and the father's genes will decide the height of the child.

2) If a male is 5 feet 9 inches tall, it means that he has 4 dominant genes and 2 recessive. He will only give 3 genes to his child. What are the possible combinations of genes that he can give?

He can give \_\_\_\_\_ dominant and \_\_\_\_\_\_ recessive

He can give \_\_\_\_\_ dominant and \_\_\_\_\_\_ recessive

He can give \_\_\_\_\_ dominant and \_\_\_\_\_\_ recessive

3) The male is 5 feet 7 inches and the female is 5 feet 5 inches. Is it possible for them to give their child the necessary genes so the child can be 5 feet 11 inches tall? Explain your answer. Diagrams are often useful.

4) If 2 parents are 5 feet 7 inches, is it possible to have a child that is 6 feet tall? Explain how this is possible.

5) If the male is 5 feet 5 inches tall and the female is 5 feet 3 inches tall, what is the tallest height that their child could attain? Explain.

6) If the male is 5 feet 7 inches tall and the mother is 5 feet 3 inches tall, what is the shortest height their child could attain? Explain.

7) List 3 other polygenic traits.

8) How are polygenic traits different from traits that only require 2 genes?